

NORTH MARIN HISTORICAL WATER USE

Water Production Data

Water production data from the various North Marin water sources was acquired, as reported in acre-feet per month. The data for the years 2002 through 2004 are listed below. The value for December 2004 was not available so the corresponding value for December 2003 was used. The average value in acre-feet and MGD is also shown.

Year	Total Production, acre-feet	Production, MGD
2002	11,210.60	
2003	10,659.97	
2004	11,007.95	
Average	10,959.51	9.78

Water Billing Data

We developed nine monthly water use tracking models from the historical water billing data using the monthly data provided by North Marin. We performed a regression analysis the time series of per account water use versus month that considered which weather variables best would account for variation in use due to the weather (weather normalization). Some general comments follow, and then brief comments on each billing category's model. The purpose of each model is to determine the average water use per account per day to forecast additional future water use as new accounts are added.

North Marin has seen a draft of the following and did provide comments that are noted in the text. They also supplied data to the end of 2004.

North Marin bills bimonthly; so we split the billed amounts to the previous and current month in proportion to their seasonal index. This isn't quite "as used" but the closest one can get to it with this data.

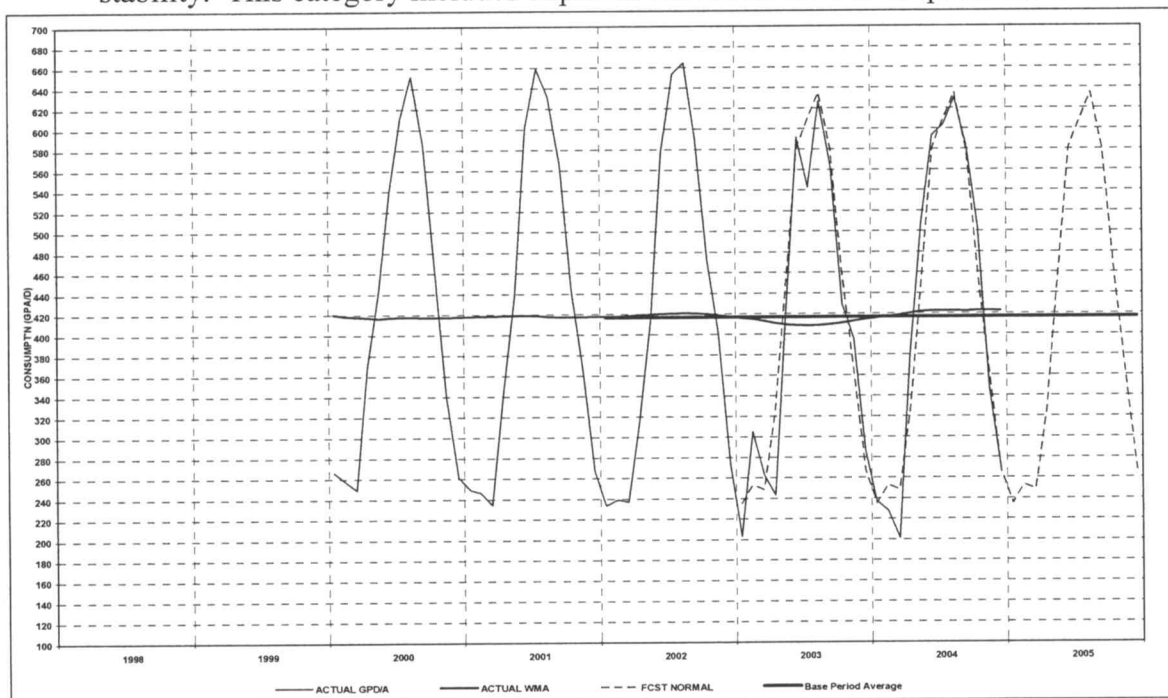
The data is for January 2000 through December 2004. The results are quite stable and the level of usage in the base period (normally 2002 to date) can be projected to annual water usage. We are providing a graph of the pattern of water use for each customer group with a few of our interpretive comments that you can either be accepted or the City can provide a more knowledgeable interpretation. These graphs have four lines (two of them have five lines):

1. Weather normalized actual water use expressed in terms of gallons per day per account (gpd/a). The weather normalization statistically derives the impact of weather on water use and restates actual water use to the level it would be with normal weather. (Normal weather is based on long term average weather for each month.)
2. A 13 month weighted moving average is calculated that runs through the center of the data, giving an easy-to-visualize picture of the pattern of use.

3. An average of the last three years is given as a potential base point for demand projections and as a reference for viewing the stability or volatility of recent years. In two cases, more than one reference line is given.
4. A regression model forecast is given for the last two years of actual data by month and for 2005 just as a reference forecast. This forecast simply projects the pattern of the prior three years without any consideration given to any conservation or other measures that the Town might take that would change the water use pattern.

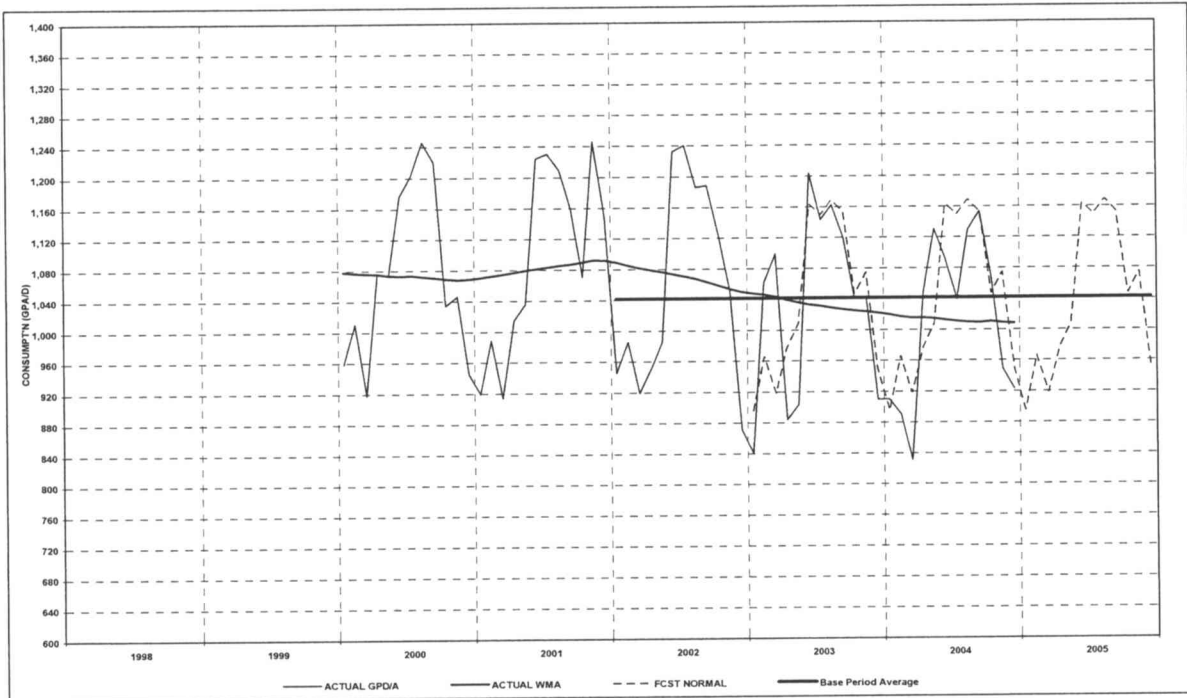
The short period of water use history is not ideal for deriving the seasonal patterns and also for deriving the coefficients for weather normalization. However, the basic stability of the water use patterns leads us to believe that the short period does not distort any results.

1. SFR The usage pattern is quite stable and the weather normalization adds to the stability. This category includes duplexes but the number is unspecified.



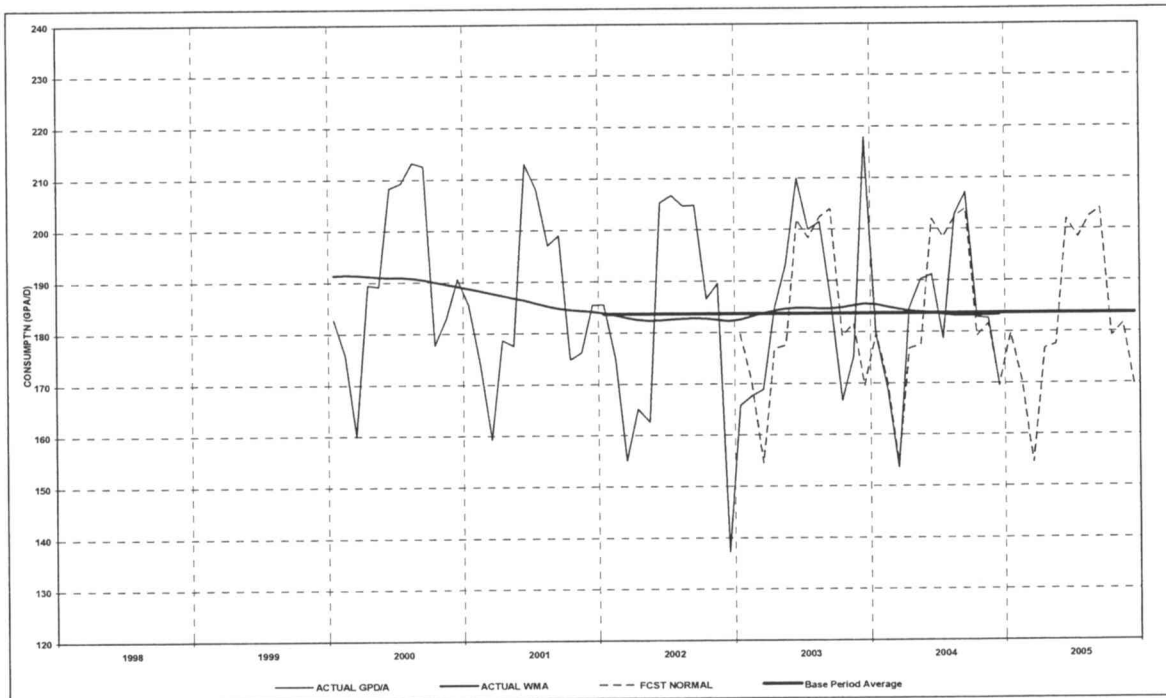
The average per account per day water use for 2000-2004 is 417.1 gallons per day per account (gpd/a).

2. Apartments (defined as 5 dwelling units or more). This time series is drifting down a little but seems to have leveled off in 2003 and 2004. There is only modest seasonality and the weather variables were not significant.

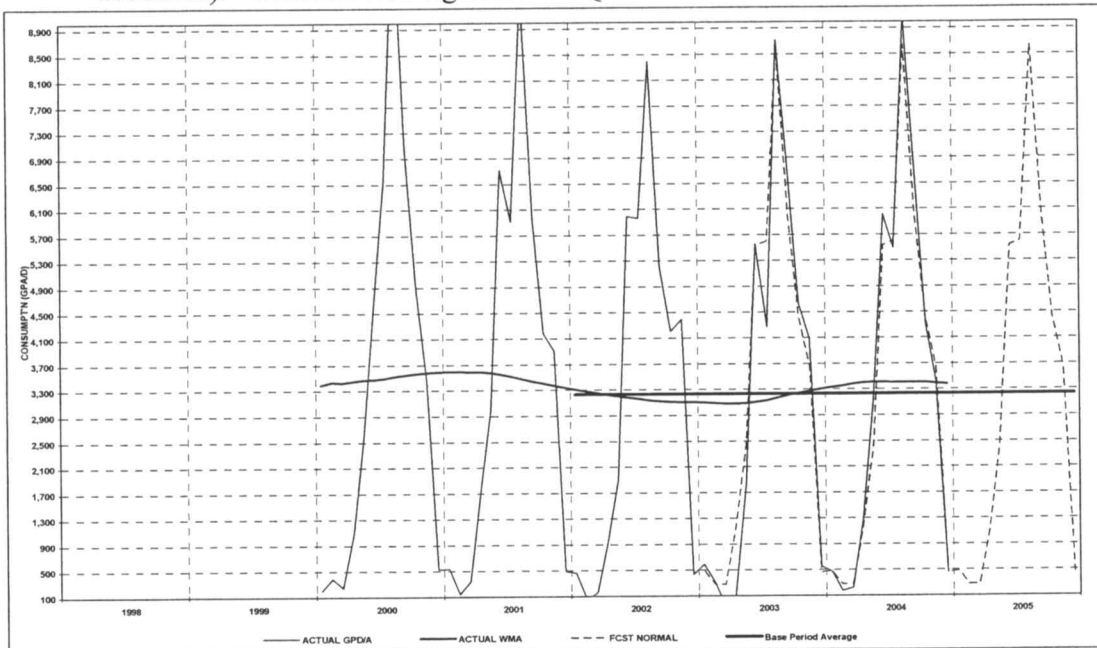


North Marin has observed that many apartments units are now billed individually on a RUBs system. It could be that the billing allocation has affected water use. The decrease from 2000-01 to 2003-04 is 5.0%, which is possibly the effect of the billing change application. But there could be some vacancy impact as with Santa Rosa. We plan to use the 2002-04 (1039.1 gpd/a as in the graph) rather than the last two years. Price impacts often don't hold up and the National Submetering Study found no water savings due to RUBs (although they did find savings due to submetering individual units and billing based on actual unit meter readings).

3. Townhouses and Condos (defined as triplexes and fourplexes). Quite a stable series and very little seasonality (partly because of the irrigation accounts). Weather variables were not significant. We think the small drop in per unit use is insignificant. The series is so stable that we will just use the average shown (183.6 gpd/a) for 2002-04.

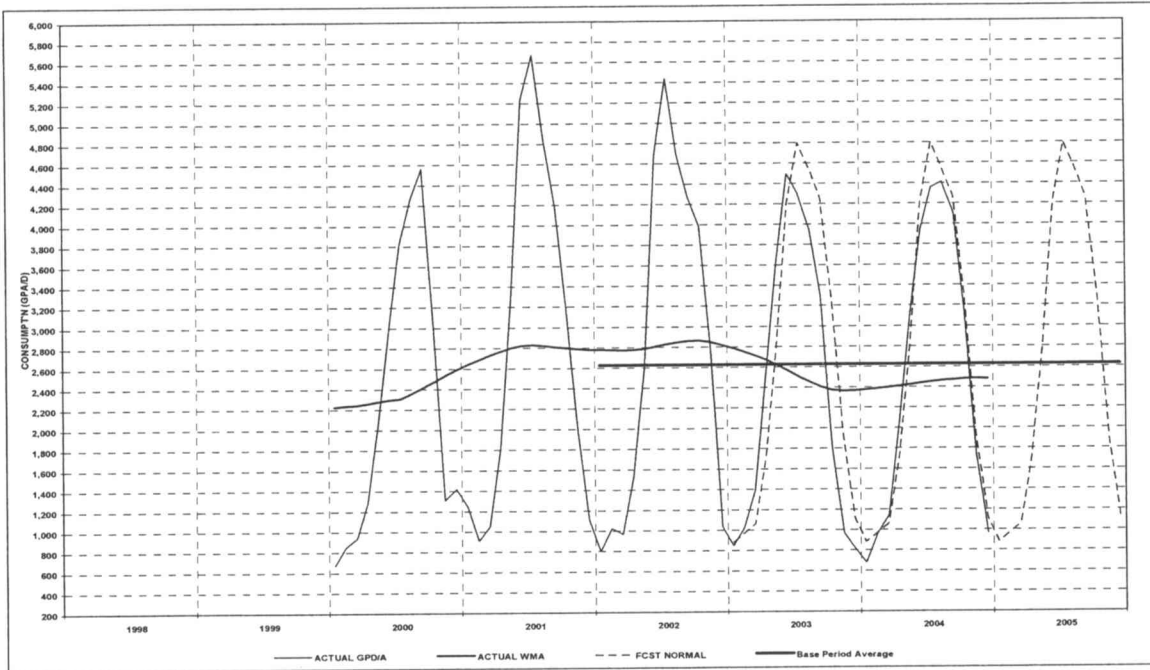


4. Irrigation Accounts (includes SFR, COM, GOV, APT, Condos, and Mobile Home accounts). Weather was significant. Quite a stable series.

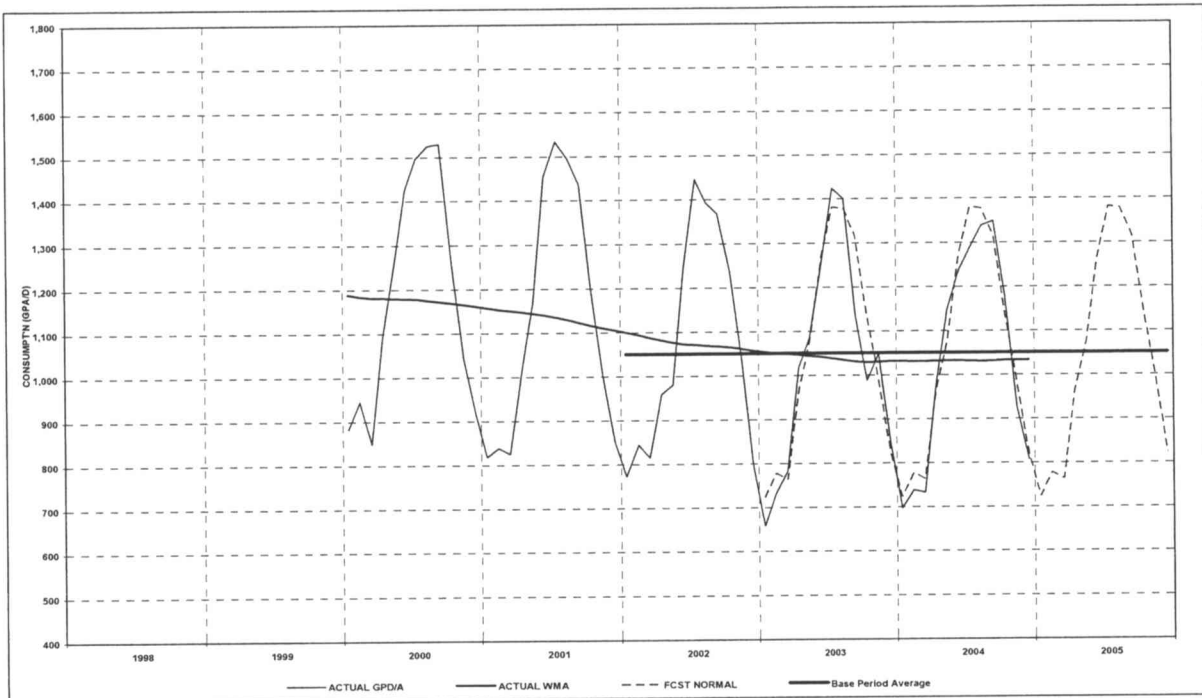


North Marin noted that 2004 demand increased 10% over 2003 (actually we get 11.9%) but 2.3 percentage points of that was reduced by the weather normalization. We would use the average shown for 2002 through 2004 which is 3244.2 gpd/per account. It could be that the weather variables didn't pick up all the weather impact since there is only 5 years to establish the pattern.

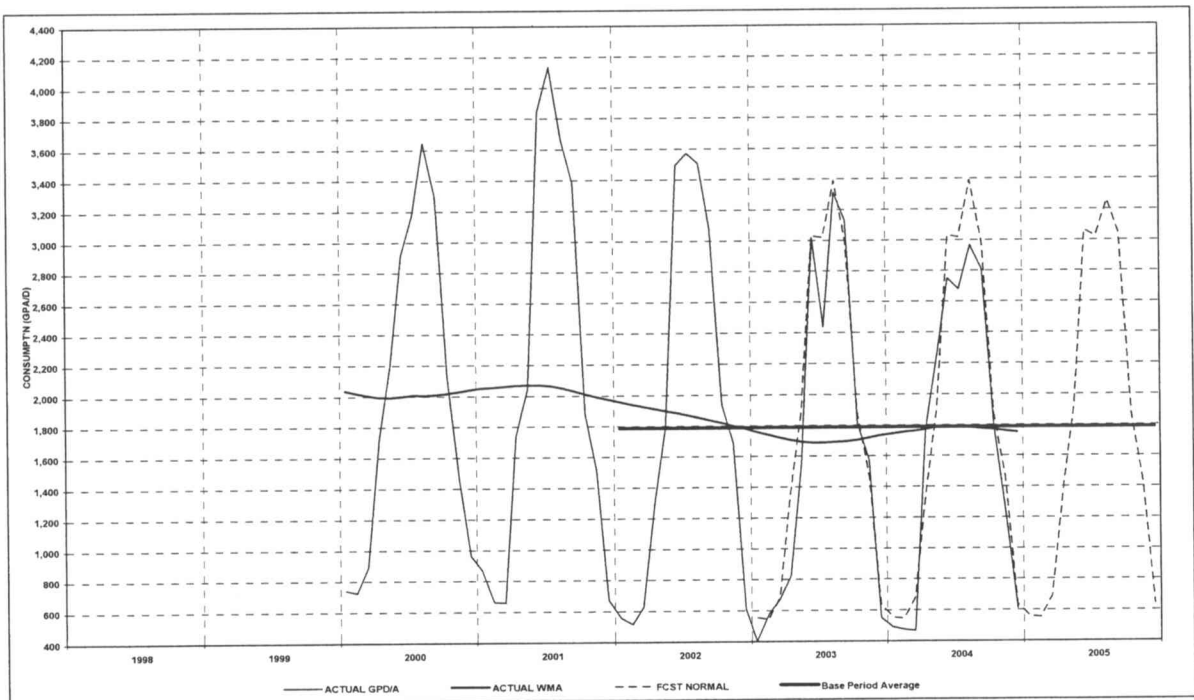
5. Government: We are surprised at the relatively high seasonality. Weather wasn't significant in the regression analysis. It could be that some of their irrigation needs are not in the separate accounts for irrigation. North Marin wasn't able to identify and sustainable cause for the reduction in 03-04 and looks at this category in terms of the whole five years. We think we should use the five-year average which is 2584.1 gpd/a.



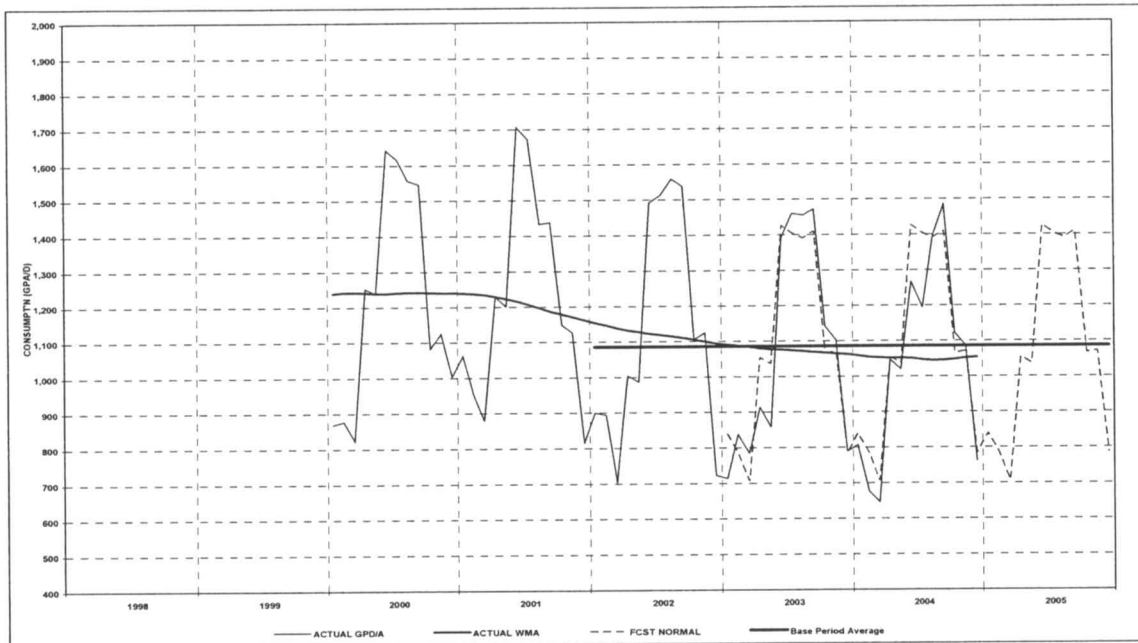
6. Commercial: This category also has a relatively high seasonality (tourist traffic?) but the weather variables were not significant. This series also has a downward drift but has been stable the last two years. North Marin pointed out the vacancy rate of 25% in 2004 and expects a recovery. As with multifamily we should pick a target vacancy rate. We have used the 2002-2004 average which is 1,049.1 gpd/a.



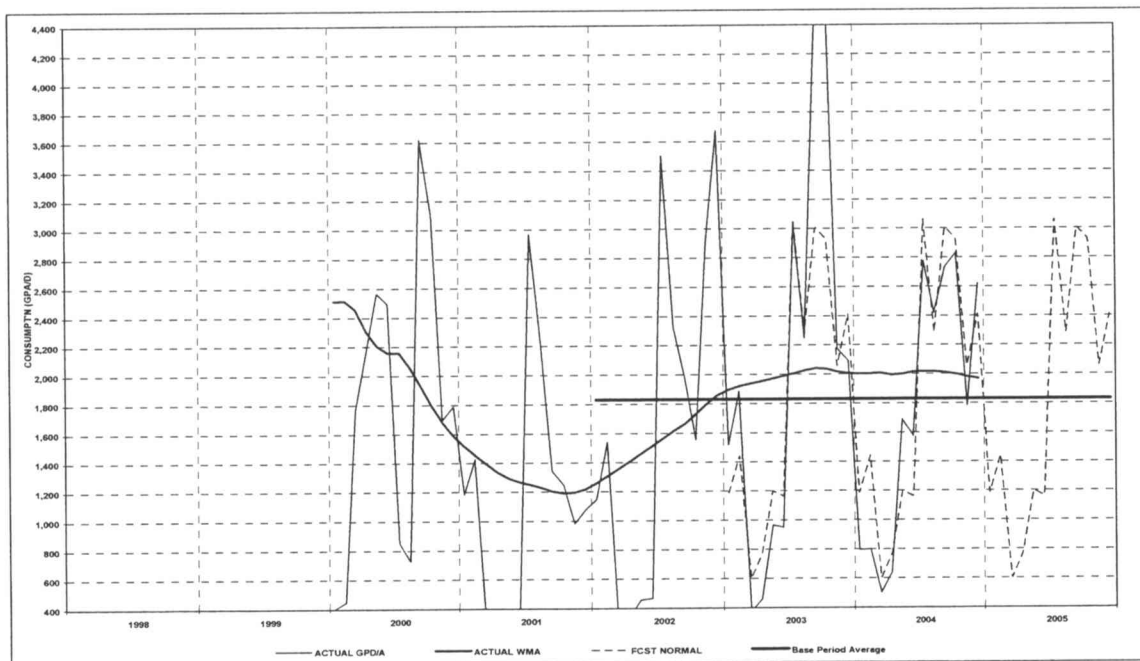
7. Pools (include SFR, APT, Condos, Commercial, and Gov pools). As you would expect the seasonality is quite high. Weather was significant which was a surprise, but maybe evaporation causes that. This series has a slight downward drift but has been stable for a couple of years. There are two less pools that in 2001 and a distinctly different seasonal pattern in 2003-04. We suggest the 2002-2004 average shown in the graph which is 1784.1.



8. Mobile Homes: This series also has a downward drift with recent stability. Weather was not significant. North Marin suggests this could be due to the retrofit on resale ordinance, since Mobile Homes have a high turnover rate. To be conservative we suggest using the average in the graph (1083), rather than the 2004 level.



9. Miscellaneous: This includes livestock watering, hydrants, temporary service. The volumes are small and I include it as a category just to account for all water billings. We plan to use the average shown for 2002-2004, i.e., 1841.8.





MEMORANDUM

Date: December 1, 2005

To: Chris Degabriele, North Marin Water District

From: William Maddaus, Maddaus Water Management

Subject: ***Revised Customer Water Demand Projections North Marin Water District
Summary of Data Inputs, Assumptions and Results***

This memorandum presents revised figures for future water demands. The demands are 3.8 percent lower than in the November 7, 2005 version of this memorandum. The reduction is to correct an error in the calculations of new mobile home and new single family accounts. Only Attachments 4 and 5 and the summary on page 1 have been revised.

LIST OF CHANGES SINCE SEPTEMBER 16, 2005 MEMO

The following changes have been made to the demand projections.

1. Changed new single family home water use factor to 424 gallons/account/day as per documentation provided by North Marin Water District (NMWD). Lowered the indoor use 20 gallons/day/account, as agreed with NMWD.
2. The commercial water use factor, in gallons/account/day was increased 13 percent to the 2000 value of 1,185.5 gpd/a from the prior value of 1,049.1 gpd/a, which was the 2002 to 2004 average account use. A detailed explanation for these new commercial water use value is provided in MWM memo dated October 26, 2005 titled ***Commercial Water Demand Factors for Water Demand Projections***.
3. Changed the installed ultra low flush toilets, efficient showers and washing machines as per the Tier one data compiled by the Sonoma County Water Agency for the North Marin Service area. This caused the baseline future water needs to increase a small amount.
4. Provided no additional growth in the mobile home sector, redirecting added population to single family new homes.
5. Added statement about average versus dry year demands on page 5.
6. Made word changes in memo for additional clarification.

As a result the demand projection for 2030 has increased 3 percent to 13.8 mgd (15,443 AF/year). (The new demand values are shown in Table 4-1 with the plumbing code included).

LIST OF CONTENTS

The following five pieces of information are included in this packet:

1. Future Population and Employment Projections (Attachment 1)
2. Historical Water Use and Demographic Data Inputs to the Model (Attachment 2)
3. Key Assumptions for the Model (Attachment 3)
4. Alternative Water Demand Projections (Attachment 4)
5. Demand Tables for Urban Water Management Plan (Attachment 5)

Each of these will be discussed in individual sections below. As this information has not been concurred with by local agencies, all of the provided information is subject to change.

1. FUTURE POPULATION AND EMPLOYMENT PROJECTIONS

Description of Population and Employment Forecasts (Attachment 1)

There are generally two main sources of population and employment projections that can be used in this model. Below is a list of the two data sources that can be used to generate future water demands.

Available Demographic Projections

- *Local General Plan (population and employment)* – Typically these plans, depending upon when they were published, have a population and jobs forecast for 2020 or 2030 and build out. The current draft of the Marin County General Plan 2005 goes out to 2030 includes a population and employment forecast. According to City Planner, Kristen Drumm, the projections provided to MWM, copy to North Marin, are based on ABAG 2003 for population and employment forecasts.
- *ABAG (population and employment)* - ABAG recently published a report in 2005 that includes population and employment estimates for each city in the Bay Area. This ABAG report also provides projections for the City of Novato and Marin County for 2005, 2010, 2015, 2020, 2025, and 2030. Projections were also made in 2002 and 2003.

At North Marin Water District's request the current projections from the 2005 draft General Plan were used as the source of population and employment forecasts. These were in turned used for the demand projections.

2. WATER USE AND DEMOGRAPHIC DATA INPUTS TO MODEL

Description of "Water Use Data Input Sheet" (Attachment 2)

Attachment 2 is a two-page print out of an Excel spreadsheet. The purpose of this "Water Use Data Input Sheet" is to gather and document basic information about the individual service area. The data shown on the "Water Use Data Input Sheet" can be broken into two main categories, (a) current water use data and (b) demographic data. Each area is broken out below and helps to provide some basic definitions and assumptions.

(a) Water Use Data

- Base Year – This is the starting year for the analysis. For this project, the recent average weather normalized data was selected as the base year for two reasons:
 1. 2004 shows less of an effect of the recession.
(The year 2002-3 shows a dip in water demand in many areas due to reduction in economic activity)
 2. 2004 had relatively “normal” climate conditions – i.e. not a drought or excessively wet year, so weather adjustments were minor
- Average gal/day/acct- This is the amount of water in gallons that is used per day, per account.
- Indoor/outdoor water use – This is the amount of water per account split into the percent that is used indoors. The corresponding remaining percent of water is used outdoors.
- Consumption by customer class- This shows the annual amount of water used for an entire calendar year, broken down by customer class (Single Family, Multi Family, Commercial, Irrigation, etc)
- Provision for New Single Family Account Use- For selected agencies, and upon their specific request, a new category can be created to model water use of new single family homes. This value is held constant in the baseline projection and not subject to plumbing codes. It is assumed that all new homes are built to the current plumbing code with low flow showerheads and low flush (1.6 gallon per flush) toilets. The plumbing codes continue to work on the existing accounts. The new home single family account use provided by North Marin Water District is 424 gallons/day/account, which is held constant in the baseline projection and not subject to plumbing codes. The plumbing codes continue to work on the existing accounts.
- Unaccounted for water (UFW) - The difference between the amount of water purchased and the amount of water that was billed. Data provided by the agency was used, if provided, unless UFW was less than 7 percent, in which case 7 percent was used. North Marin Water District has agreed to use 7 percent for future UFW planning purposes.
- Water Produced- This is the total amount of potable water produced by Forestville Water District. The water can come from multiple sources including amount purchased from SCWA, purchased from other agencies, local surface water, or obtained from groundwater. This does not include recycled water.
- Peak day factor – The ratio of water produced on the maximum day of the year to that produced on the average day. The value used in the recent SCWA Water Master Plan for agencies was used where available; otherwise a value of 1.6 was used. North Marin Water District requested to use a peak day factor of 1.77.

(b) Demographic Data

- Census 2000 – The 2000 Census data was used as a reference when determining population and household sizes for each individual city (and/or unincorporated area) serviced by the water agencies. For North Marin Water District a table of 2000 Census tract data was developed that adjusted tract boundaries to match the service area boundaries. This census tract value was then used as a basis for the 2004 base year population. This work was done by the Marin County planning department.
- Department of Finance 2004 estimate– The State of California Department of Finance provides official estimates between censuses. The 2004 Department of Finance value for the City of Novato is shown on Attachment 2. It shows a value less than the service area as the boundaries for the city and for the service area do not exactly align.
- Single and multi family dwelling units– The 2004 single family dwelling units is equal to the number single family accounts for 2004. The 2004 multi family dwelling unit estimate was calculated by applying a growth factor to the 2000 data as noted on the water use data sheet in Attachment 2.
- Procedure for service areas not contiguous with city boundaries – When a service area serves outside a city boundary, estimates were generated either from census data when available for the unincorporated areas, Department of Finance data, ABAG Projections, DWR reported data, General Plan or by the agency if known. If none of the six sources were available, then the modeling team worked with the local water district to make reasonable estimates.
- Employment data (ABAG) – The employment figures were gathered from the Association of Bay Area Governments (ABAG) report dated 2005. These numbers were developed regionally, and are based on the 2000 Census.

In summary, the key features of this sheet include the existing 2004 (baseline) level of water use, 2004 baseline accounts in each customer category, and 2004 baseline forecasts for population.

3. KEY ASSUMPTIONS FOR THE MODEL

Key Assumptions for the Model (Attachment 3)

The one page table shown in Attachment 3 shows some of the key assumptions used in the model. The assumptions having the most dramatic effect on the results are the natural replacement rate of fixtures, how residential or commercial future use is projected, and finally the percent of unaccounted for water.

4. WATER DEMAND PROJECTIONS

Development of the Water Demand Projections Table and Graph (Attachment 4)

Water demand projections were developed out to the year 2034 using the Demand Side Management Least Cost Planning Decision Support System (DSS) model. This model incorporates information from the:

- “Water Use Data Sheet” and the “Key Assumptions” shown in Attachments 2 and 3

- Questions asked of agencies
- Agency provided data
- 2000 Census data
- 2000 to 2004 Department of Finance population data
- Local General Plans
- Association of Bay Area Governments Projections

Attachment 4 shows the projected demands with and without plumbing codes and appliance standards. This page includes both a table and a graph. Each will be described below.

California law requires that for new construction after January 1, 1992 only fixtures meeting the following standards can be installed in new buildings:

- Toilet – 1.6 gal/flush maximum
- Urinals – 1.0 gal/flush maximum
- Showerhead and Faucets – 2.5 gal/min at 80 psi

Replacement of fixtures in existing buildings is governed by the Federal Energy Policy Act that requires only the above can be sold after January 1, 1994 for residential use and January 1, 1997 for commercial toilets. This law governs natural replacement.

New clothes washers are required to meet increased energy efficiency standards in 2004 and 2007. It is expected that this will lead to water efficiency improvements (efficient washers use at least 33% less water) by no later than 2007. We have assumed that by 2007, 30 percent of washers purchased will be efficient, by 2010, 50 percent purchased will be efficient, by 2015, 75 percent will be efficient, and by 2020, 100 percent purchased will be efficient.

Graph of projected demands (Figure 4-1)

Figure 4 shows the projection at five-year increments. The graph shows projections through 2034.

Table of water demand projections (Table 4-1)

The table of water demands projections includes:

1. The water demand projections are based on the future population and employment projections shown and described above in Attachment 4.
2. Table 1-1 shows the population and employment projections used to prepare the demand projections.
3. Projections were made *with and without* the plumbing codes.
4. Projections are for potable water only. It does not include recycled water use. Recycled water use and projections are included in Chapter 5 of UWMP.

Dry Year Demands

The demand projections reflect average weather conditions and **do not** reflect drier, hotter, non-drought conditions.

5. WATER DEMAND PROJECTIONS – 2005 URBAN WATER MANAGEMENT PLAN (UWMP) FORMAT

Conversion of the Water Demand Projections Table and Graph to 2005 UWMP Format (Attachment 5)

The 2005 Urban Water Management Plan Guidance Document from the California Department of Water Resources (Ca DWR) requests that future demand information be in a specific format. Provided in Attachment 5 are the five tables relating to future average day demands they requested. The demand projection shown is the “with Plumbing Code” demands and is otherwise the same as appeared in the above table and graph. The demand projections in the Urban Water Management Plan will be included in Chapter 3.

NEXT STEPS

The following five steps remain to finalize the demand projections and evaluate conservation measures.

1. Contractor to concur with baseline projection
2. Evaluate Tier One conservation measures with the model
3. Develop projections with alternative levels of conservation
4. Provide information on the cost-effectiveness of water conservation
5. Identify individual agency projections with planned conservation

ATTACHMENTS

Attachment 1	Future Population and Employment Projections (Figure 1-1 and Table 1-1)
Attachment 2	Water Use Data Input Sheet
Attachment 3	Key Model Assumptions (Table 3-1)
Attachment 4	Alternative Water Demand Projections (Figure 4-1, Table 4-1)
Attachment 5	UWMP Tables for Chapter 3 (Ca DWR format)

Attachment 1 – Population and Employment Projections

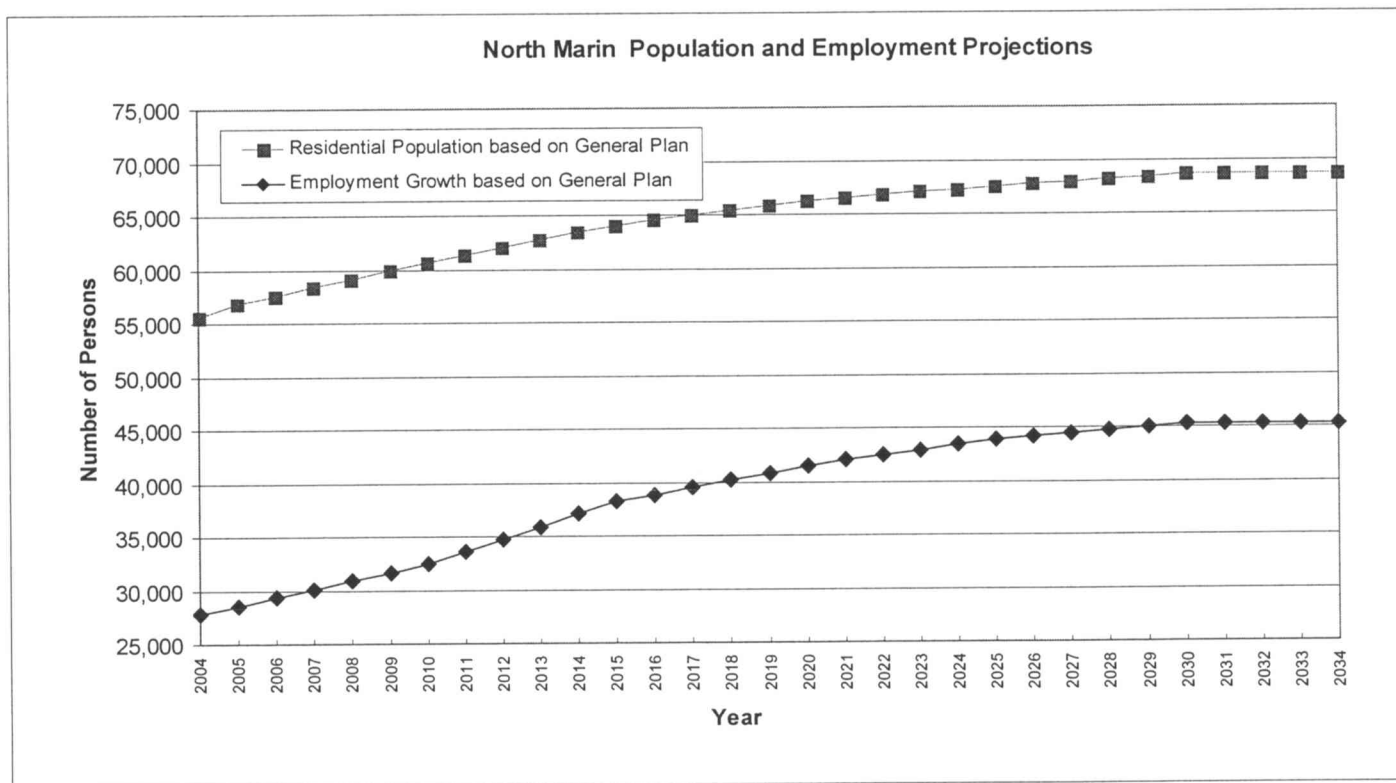


FIGURE 1-1
Population and Employment Projections for North Marin Water District

TABLE 1-1
Population and Employment Results for North Marin Water District

Projection	Residential Population						
	2004	2005	2010	2015	2020	2025	2030
Residential Population	55,587	56,816	60,674	64,072	66,271	67,569	68,669
Employment	27,813	28,588	32,459	38,204	41,503	43,867	45,295

Attachment 2 – Water Use Data Input Sheet (Page 1)

North Marin WD Water Service Area ¹										
DSS Input Sheet										
November 6, 2005										
Base Year Average Use and Indoor Percentages by Billing Category for DSS Model²										
	Single family		Apartments		Condo		Commercial		Irrigation	
Year	Average, gpd/a	Indoor	Average, gpd/a	Indoor	Average, gpd/a	Indoor	Average, gpd/a	Indoor	Average, gpd/a	Indoor
2004	417	58%	1039	87%	184	95%	1186	65%	3244	0%
Bimonthly billing Apartments are 5 or more units Includes 1, 2, 3 and 4 units										
	Government		Miscellaneous		Pools		Mobile Homes		New Single Family	
	Average, gpd/a	Indoor	Average, gpd/a	Indoor	Average, gpd/a	Indoor	Average, gpd/a	Indoor	Average, gpd/a	Indoor
	2584	52%	1842	0%	1784	0%	1083	77%	424	52%
Livestock watering, hydrants, temporary service										
Provided By David Bentley 10/03/05 email										
Data for DSS Model - - Base Year 2004										
Category	Number of Accounts FY. 2004 ³	Water Use 2004 gpd/a ²	Water Use, MGD 2004	Use Profile Percent	Water Use gpd	Indoor Water Use gpd				
Single family	14,167	417	5.909	60.03%	150	87				
Apartments	623	1,039	0.648	6.58%	90	78				
Condo	2,757	184	0.506	5.14%	83	78				
Commercial	1,009	1,186	1.196	12.15%						
Irrigation	331	3,244	1.075	10.92%						
Government	96	2,584	0.247	2.51%						
Miscellaneous	43	1,842	0.079	0.80%						
Pools	39	1,784	0.070	0.71%						
Mobile Homes	105	1,083	0.113	1.15%						
New Single Family	1	424	0.000	0.00%						
Total Billed in 2004	19,170	13,787	9.842	100.00%	Weather Normalized Usage for 2004					
Total Non Weather Normalized Water Produced ⁴ =			9.77	MGD						
Unaccounted For Water (UFW) ⁵ =				Percent						
Estimated UFW for DSS Model =			7.0%	Percent	7% if actual is < 7%, otherwise = agreed upon by agency for 30 year forecast					
Water Produced for use in DSS Model =			10.583	MGD	Add UFW % to Total Billed Water Use					
					Water Produced = Billed / (1 - Projected UFW for DSS Model) = 10.583					
Peaking Factor			1.77		Provided by Agency or Water Master Plan (or NA)					
Peaking Factor for DSS Model =			1.77		If NA use default value of 1.6.					
<div style="border: 1px solid black; padding: 2px; margin-top: 5px;"> - Blue cells are entered by modeler </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> - Yellow cells are input to DSS Model </div>										
NOTES										
1 - Communities served (includes all or portions of) Novato and surrounding rural areas.										
2 - Average gpd/a is based on a 12-month moving average through December 2004. Indoor use is based on average of 2 lowest consecutive months in the winter if meters read bimonthly, or single lowest month if meters read monthly.										
3 - Number of accounts is from data provided by water agency for this project (see worksheet with account data in this file).										
4 - Total water Purchased (produced) provided by North Marin Water District.										
5 - Unaccounted for Water (UFW) is the percent difference between the total water produced and the total billed water use.										
6 - For reference see additional population estimates provided in population and employment estimates corresponding to service area table.										
7 - Initial estimate based on census data for renter occupied units. For reference see table below that has 2000 census data for corresponding water service area city or cities.										
8 - Group Quarters Population includes Institutionalized and non-Institutionalized persons and assumes their water use is in the Commercial sector.										
Definitions / Abbreviations										
ABAG	Association of Bay Area Governments		HHHS	household size						
DOF	Department of Finance		NA	not available						
DSS	Decision Support System Model		MF	multi family						
du	dwelling unit		MGD	million gallons per day						
FY	Fiscal Year		No.	number						
gpd	gallons per capita / per day		Pop	population						
gpd/a	gallons per day / per account		Res	residential						
gpd	gallons per day		SF	single family						
			UFW	unaccounted for water						
Data Prepared : 1-May-05 By: M. Maddaus Revised: 6-Nov-05 By: W. Maddaus										

Attachment 2 – Water Use Data Input Sheet (Page 2)

North Marin WD Water Service Area ¹					
Reconcile agency account billing data and census data					
Total Dwelling Units in Census 2000 for North Marin Water District by Census Track					
	2000 Units	No. Meters	Service Area Billing Accounts - Year 2000 ³	Difference between billing and census data	Data Sources / Notes
Single family					
1-detached	12,817	12,817			
Subtotal Single Family	12,817	12,817	13,538	721	When difference is positive some of the detached units classified in other categories
Condo			13,538	0	Single family billing must be detached plus some attached units
1-attached	2,584	2,584			
2-units	289	289			
3-4 units	886	886			
Subtotal Condo	3,759	3,759	2,636	-402	When this number is negative some of the attached units classified in other categories
Apartments					
5 to 9 units	1,176	235			Condo billing must be some of the 1,2,3,4 unit buildings but not all
10 to 19 units	732	73			Assumes 7 units per building
20 to 49 more units	579	29			Assumes 15 units per building
50 or more units	941	19			Assumes 35 units per building
Subtotal Apartments	3,428	356	627	271	Assumes 50 units per building
Mobile Homes					
mobile homes	706	94			Must be more than one meter on an Apartment building
Subtotal mobile homes	706	94	103	-9	Some large accounts must have more than one meter
Apartment Average =	9.6	units/building	5.5	units/account	Meter for mobile home parks, assume 7.5 units per master metered park,
Occupied SF+Condo+Apartment+MHome units =	20,710				Although some mobile homes may be separately metered
Vacant Units =	532				This is a typical value of DUs/account for apartments
Total Units =	21,242				
2000 Group Quarters Data			2000 Census Data		
Institutionalized	618	Average household size	2.45		
Non-Institutionalized	364	Average household size of owner-occupied unit	2.47		
Mobile home population	1,747	Average household size of renter-occupied unit	2.45		
Total	2,729	Homeowner vacancy rate (percent)	0.90		For City of Novato
		Rental vacancy rate (percent)	2.50		For City of Novato
Population and Household Size in Census 2000 for North Marin Water District					
	Service Area 2000	Estimated Population 2004	Estimated Service Area Residential Population 2004		Data Sources / Notes
Total Population from Census data ⁶ =	53,364	55,587			Estimated growth from 2000 to 2004 (ABAG Subregional Projections): 5.31%
Subtract Institutionalized, Mobile Home Population =	2,729	2,874			Estimated employment growth from 2000 to 2004 (DOF Employment Projections): 4.17%
Residential Population =	50,635	52,713			Water use for the institutionalized population is accounted for in nonresidential billing categories
Avg. HHS ⁷ =	2.44	2.44			Residential population shown corresponds to the city or cities represented by Census data
Apt Pop @ MF HHS ⁷ =	2.00	6,856	7,220	13.0%	Estimated employment growth from 2000 to 2004 (ABAG Employment Projections): 0.97%
Condo Pop @ Condo HHS =	2.20	5,799	6,107	11.0%	Percent of Population that is Apartments
SF Pop =	37,980	39,386	39,386	70.9%	Percent of Population that is Condo
SF HHS ⁷ =	2.81	2.78	2,874	5.2%	Percent of Population that is SF
		Total	55,587	100.0%	Percent of Population that is Mobile Home & Group Quarters
					Total 2004 service area Population
Estimate Service Area Dwelling Units for 2004					
SF Res	14,167	Equals No. of Single Family accounts for 2004			
MF Res	3,571	Equals No. Dwelling Units from cell M28 (2000 Census Data) plus growth in accounts for four years from cell V41 less single family billing accounts (2004)			
Condos	2,757				
Total Units w/o mobile	20,495				
Population and Employment Estimates Corresponding to City of Novato (smaller than service area)					
	Population	Employment			
2000 Census data for service area	53,364	NA			
2000 ABAG (jurisdictional)	47,630	25,650			Based on ABAG 2005 Projections for City of Novato only
2005 ABAG Projection (jurisdictional)	50,900	25,960			Based on ABAG 2005 Projections for City of Novato only
2000 ABAG (subregional)	50,359	26,150			Based on ABAG 2005 Projections for City of Novato only
2005 ABAG Projection (subregional)	53,700	26,460			Based on ABAG 2005 Projections for City of Novato only
2005 Marin County General Plan	56,816	28,585			For North Marin Service Area
2000 Department of Finance Estimate	47,630				From State of California Department of Finance (DOF) table E-4 as of 4-1-2000. Website www.dof.ca.gov
2001 Department of Finance Estimate	48,389				From State of California Department of Finance (DOF) table E-4 as of 1-1-2001. Website www.dof.ca.gov
2002 Department of Finance Estimate	48,795				From State of California Department of Finance (DOF) table E-4 as of 1-1-2002. Website www.dof.ca.gov
2003 Department of Finance Benchmark	48,728				From State of California Department of Finance (DOF) table E-4 as of 1-1-2003. Website www.dof.ca.gov
2004 Department of Finance Estimate	49,614				From State of California Department of Finance (DOF) table E-4 as of 1-1-2004. Website www.dof.ca.gov
2005 Department of Finance Estimate	50,586				From State of California 2004 Estimate based on "ABAG 2005 Projections"
2004 Employment in Service Area (input to DSS Model) =		27,813			Based on 2005 Marin County General Plan number for 2005 minus 2.7% which is annual employment growth rate

Attachment 3 – Key Model Assumptions

TABLE 3-1
List of SCWA Baseline Demand Projection Assumptions for DSS Model

Parameter	Model Input Value, Assumptions, and References
Base Year	2004
Peak Day Factor	1.77
Unaccounted for Water, % of Water Production	Calculated from historical production and sales data or 7%, whichever is greater; constant over time. North Marin Water District requested value for UFW is 7%.
Population Projection, 2005 to 2034	Marin County Draft General Plan, 2005
Employment (Jobs) Projection 2005-2034	Marin County Draft General Plan, 2005
Number of Water Accounts for Base Year	Data submitted by customers for 2004
Distribution of Water Use Among Categories	Data submitted by customers for most recent year
Indoor/Outdoor Water Use Split by Category, % of Total	Monthly data submitted by customers
Residential End Uses, %	AWWARF Report "Residential End Uses of Water" 1999
Non-Residential End Uses, %	Professional judgment and AWWARF Report "Commercial and Institutional End Uses of Water" 1999
Residential Fixture Efficiency (Current existing fixtures installed in residential units)	Census 2000, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Reference "High Efficiency Plumbing Fixtures - Toilets and Urinals" Koeller & Company July 23, 2005. Reference Consortium for Efficient Energy (www.cee1.org)
Water Savings for Fixtures, gal/capita/day	AWWARF Report "Residential End Uses of Water" 1999
Non-Residential Fixture Efficiency (Current fixtures installed in non-residential facilities)	Census 2000, assume commercial establishments built at same rate as housing, plus natural replacement plus rebate program (if any)
Residential Frequency of Use Data, Toilets, Showers, Washers, Uses/user/day	Falls within ranges in AWWARF Report "Residential End Uses of Water" 1999
Non-Residential Frequency of Use Data, Toilets and Urinals, Uses/user/day	Estimated based using AWWARF Report "Commercial and Institutional End Uses of Water" 1999
Natural Replacement Rate of Fixtures	Residential Toilets 3% (newer toilets), 4% (older toilets) Commercial Toilets 4% Residential Showers 4% Residential Clothes washers 6.7% A 4% replacement rate corresponds to 25 year life of a new fixture based on data published in "High Efficiency Plumbing Fixtures - Toilets and Urinals" Koeller & Company July 23, 2005. A 4% replacement rate is also the CUWCC recommended value. A 6.67% replacement rate corresponds to 15 year washer life based on "Bern Clothes Washer Study, Final Report:, Energy Division, Oak Ridge National Laboratory, for U.S. Department of Energy, March 1998, Internet address: www.energystar.gov
Future Single Family, Apartment, Condo, Pools, Mobile Home Water Use	Based on Projected Population Growth
Future Commercial, Government, Miscellaneous Water Use	Based on Projected Employment Growth
Future Irrigation Water Use	Based on Projected Employment Growth

Attachment 4 –Projected Potable Water Demands

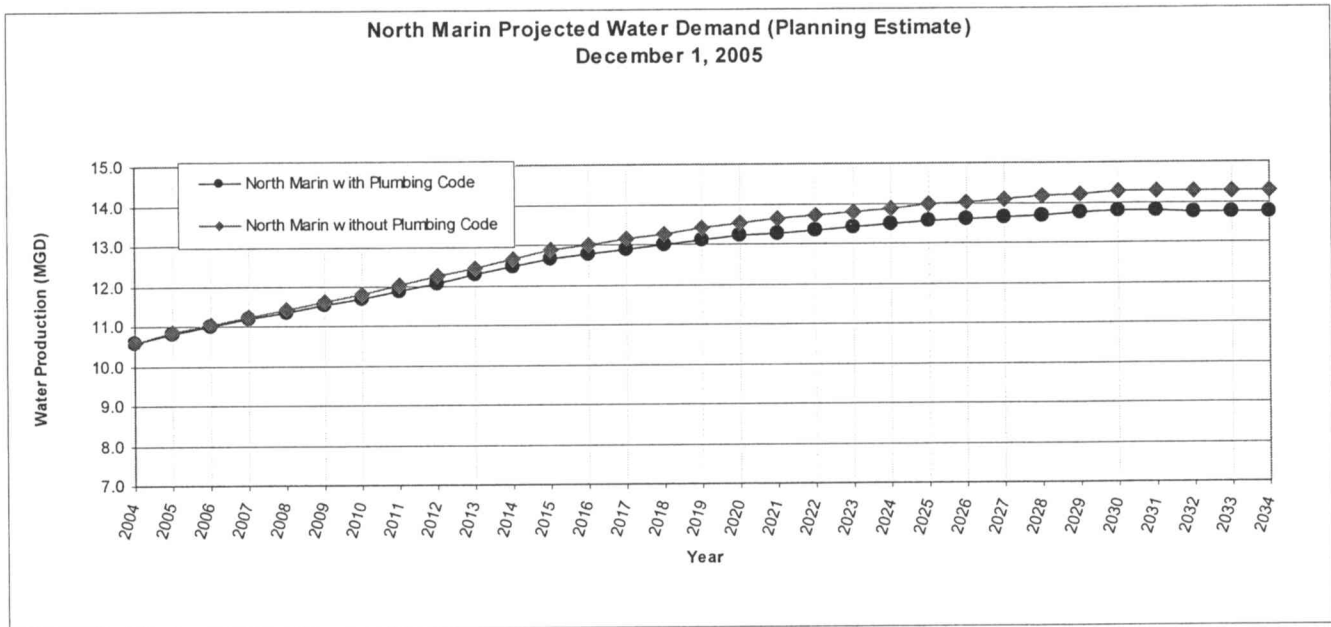


FIGURE 4-1
Baseline Potable Water Use Projections for North Marin Water District

TABLE 4-1
Baseline Potable Water Use Results for North Marin Water District

Data Source for Projection		Plumbing Code	Total Potable Water Production, Average Day (MGD)						
Residential	Non-Residential		2004*	2005	2010	2015	2020	2025	2030
General Plan	General Plan	Included	10.6	10.8	11.8	12.9	13.5	14.0	14.3
General Plan	General Plan	Not Included	10.6	10.8	11.7	12.7	13.2	13.5	13.8

*Weather normalized. Total Water use is potable only. Does not include recycled water use. Recycled water use and projection is in Chapter 5 of UWMP.

Attachment 5 –Urban Water Management Plan Tables for Chapter 3 of 2005 UWMP

Table 3-1 below provides population projections for North Marin Water District's service area.

Table 3-1. (DWR Table 2). Population – Current and Projected

Year	Population
2005	56,816
2010	60,674
2015	64,072
2020	66,271
2025	67,569

3.2 Past, Current, and Future Water Use

3.2.1 Water Use By Customer Type

The historical and projected number of connections and deliveries to North Marin Water District's water distribution system, by sector is identified below on Table 3-2.

Table 3-2. (DWR Table 12). Past, Current and Projected Water Deliveries

			Water Use Sectors										
Year			Single Family	Apart ments	Condo	Commere cial	Irrigation	Govt	Misc	Pools	Mobile Home s	New Single Family	Total
2000	metered	# of accounts											
		Deliveries AF/Y											
2005	metered	# of accounts	14,167	637	2,818	1,037	341	98	44	40	105	336	19,622
		Deliveries AF/Y	6,612	737	577	1,371	1,238	284	91	80	127	160	11,276
2010	metered	# of accounts	14,167	680	3,010	1,177	387	112	50	43	105	1,391	21,120
		Deliveries AF/Y	6,569	770	606	1,530	1,405	323	103	85	127	661	12,179
2015	metered	# of accounts	14,167	718	3,178	1,385	455	131	59	45	105	2,320	22,563
		Deliveries AF/Y	6,513	796	629	1,776	1,654	380	121	90	127	1,102	13,187
2020	metered	# of accounts	14,167	743	3,287	1,505	494	143	64	47	105	2,922	23,475
		Deliveries AF/Y	6,453	808	640	1,914	1,797	413	132	93	127	1,388	13,763
2025	metered	# of accounts	14,167	758	3,352	1,591	523	151	67	48	105	3,276	24,036
		Deliveries AF/Y	6,398	811	643	2,012	1,899	436	139	95	127	1,556	14,115
2030	metered	# of accounts	14,167	770	3,406	1,642	540	156	70	48	105	3,577	24,480
		Deliveries AF/Y	6,356	814	646	2,069	1,961	451	144	96	127	1,699	14,363

3.2.2 Water Sales to Other Agencies

North Marin Water District does not currently sell water to any other agency.

Table 3-3. (DWR Table 13). Sales to Other Agencies

Water Distributed	2000	2005	2010	2015	2020	2025	2030
N/A	0	0	0	0	0	0	0

3.2.3 Unaccounted-for Water and Additional Water Use

For this project unaccounted for water is defined to be the difference between water produced and water sold to customers. Unaccounted-for water use normally includes unmetered water use such as for fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, and unauthorized connections. Unaccounted-for water can also result from meter inaccuracies.

Table 3-4. (DWR Table 14). Additional Water Uses and Losses, AF/yr

Water Use	2000	2005	2010	2015	2020	2025	2030
Saline barriers	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Groundwater recharge	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Conjunctive use							
raw water	N/A	N/A	N/A	N/A	N/A	N/A	N/A
recycled	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unaccounted-for system losses	N/A	848	915	988	1034	1061	1081
Total	N/A	848	915	988	1034	1061	1081

3.2.4 Total Water Use

The total past, present and future water use for the system is shown in the table below.

Table 3-5. (DWR Table 15). Total Potable Water Use, AF/yr

Water Use	2000	2005	2010	2015	2020	2025	2030
(Total of Tables 3-2, 3-3, 3-4)	NA	12,124	13,093	14,174	14,797	15,176	15,443

*Total Water use is potable only. Does not include recycled water use. Recycled water use and projection is in Chapter 5 of UWMP.